



**Materials
Processing
Institute**



Metallurgy Course

26th to 27th March 2019

COURSE OVERVIEW

The Metallurgy Course provides an excellent understanding of both the science and technology of metals, primarily for carbon and alloy steels. Alongside the classroom lectures will be a number of practical sessions, held in a well-equipped metallographic laboratory.

COURSE SPEAKERS:

The course will be delivered by very experienced personnel from operational, technical and R & D backgrounds from the Materials Processing Institute and other metallurgical consultancies. This includes experts in forensic metallurgy, root cause analysis, engineering, plant integrity, quality, performance improvement and control.

WHO SHOULD ATTEND

- > Manufacturing
- > Design
- > Fabrication
- > R & D
- > Technical
- > Quality Control
- > Supply Chain

CONTENT

- > Chemical Metallurgy
- > Basics of Metallurgy
- > How steel is made
- > Practical Metallography
- > Mechanical testing
- > Iron – Carbon: non and low alloyed steels
- > Mechanical Properties
- > Heat treatment of steel
- > Corrosion
- > Failure of metals

LEARNING OUTCOMES

The course will provide a theoretical and practical understanding of the metallurgy of metals, particularly carbon and alloy steels. An excellent understanding of the processes, products and properties of steels used to make typical steel products.

ORGANISATION/REGISTRATION

Materials Processing Institute
Eston Road
Middlesbrough, TS6 6US
United Kingdom
Tel: + 44 (0)1642 382000
email: training@mpiuk.com
Website: www.mpiuk.com/training

COURSE VENUE & FACILITIES

The course will be held at the Materials Processing Institute, Middlesbrough, United Kingdom.

COURSE PRICE

£580 + VAT / Subject to availability.
This price includes lunches and refreshments.

Metallurgy Course

COURSE PROGRAMME

Tuesday 26th March 2019

- 09:00 Arrival, reception and refreshments.
Introduction to course and facilities
- 09:15 **Basics of Metallurgy (part 1)** - *What is a metal, periodic table, ferrous and non-ferrous metallurgy (e.g. iron, steel, copper, titanium, nickel and aluminium)*
- 10:15 Break
- 10:30 **Basics of Metallurgy (part 2)**
Crystalline structures, examples of equilibrium phase diagrams, cooling curves, typical solidification structures, shrinkage, segregation
- 12:00 Lunch
- 12:45 **How Steel is Made (equipment, process and customer requirements)**
*Basic Oxygen Steelmaking & Electric Arc Furnace
Secondary Steelmaking
Continuous Casting
Ingot Casting
Cold & Hot rolling*
- 14:30 **Practical Metallography (part 1)**
Selection & sample preparation, etchants, micro & macro structures, sulphur prints
- 15:30 Break
- 15:45 **Mechanical Testing & Mechanical Properties** - *Tensile, impact (charpy), hardenability, creep, fatigue, non-destructive testing, ductility, yield stress, toughness, strength, elongation, formability*
- 17:15 Discussion
- 17:30 End of Day One

Wednesday 27th March 2019

- 09:00 **Iron – Carbon: non and low alloyed steels** - *Chemical compositions, role of alloying elements, strengthening mechanisms (precipitation strengthening, ferrite grain size, dislocations.)*
- 10:30 **Heat Treatment of Steels** - *Isothermal transformation diagrams, continuous annealing, normalising, hardening, Q & T, bake hardening, controlled rolling, solid solution strengthening, dehydrogenisation*
- 12:00 Lunch
- 12:45 **Practical Metallography (part 2)** - *optical & scanning electron microscopes, inclusions and steel cleanliness determination*
- 14:00 Break
- 14:15 **Corrosion** - *Forms of corrosion, case studies, corrosion control including use of corrosion resistant steels*
- 15:00 **Failure of Metals** - *Failure mechanisms, fracture mechanics, forensic metallurgy, failure investigations, case studies in Met Lab*
- 17:00 Discussion
- 17:15 End of Course